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AN INTEGRATED, TRANSDISCIPLINARY APPROACH TO THE MANAGEMENT OF AQUATIC CULTURAL LANDSCAPES

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CONTENTS

INTRODUCTION

Considering the increasing recognition of the decline of aquatic ecosystems as a major threat to global biodiversity, loss of unique cultural landscapes and the urgent need for sustainable water resource, this research holds great relevance and significance. Managing aquatic cultural landscapes represents the complex relationship between human society and natural ecosystems. The thesis advocates for a multidisciplinary approach, which combines principles and practices from various fields, emphasizing the interconnectedness of ecological health, cultural heritage, and sustainable community development.

The thesis explores the challenges posed by rapid urbanization, climate change, and unsustainable practices on water resources management in view of water scarcity, pollution, and ecosystem degradation, suggesting the development and application of sustainable practices that prioritize water conservation, integrated water management, and natural ecosystem protection. Therefore, the methodology is fundamentally multidisciplinary, drawing on concepts from agriculture, regional, local, and urban planning, cultural heritage conservation, ecology, social sciences, and economics.

Furthermore, a significant focus of the thesis is on exploring nature-based solutions (NBS) for water retention and their transformation into small-scale, multifunctional agricultural systems with particular emphasis on urban and peri-urban agriculture. It contrasts traditional grey infrastructure methods with more sustainable NBS, highlighting the benefits of the latter in mitigating flood hazards, enhancing biodiversity, and providing recreational benefits.

Another essential aspect of the thesis is the examination of the impacts of climate change on water resource management. Addressing the multifaceted challenges posed by climate change necessitates a holistic approach that spans multiple sectors. Climate adaptation measures, including the improvement of watersheds to ensure hydrological stability, stand as vital initiatives.

OBJECTIVES

Overall objectives

The objectives contribute to a holistic approach for managing aquatic cultural landscapes, emphasizing the integration of environmental conservation, cultural heritage preservation, community engagement, and sustainable development practices.

1. Nature-Based Solutions (NBS) for Water Management: The research explores how NBS can enhance water retention, mitigate flood risks, and transform small-scale agricultural systems. It underscores the multifunctional benefits of NBS, including their roles in water quality improvement, biodiversity enhancement, and flood mitigation, while also providing social and economic benefits like health improvement and boosting eco-tourism.

2. Impact of Climate Change on Water Resource Management examines the challenges that climate change poses to water management, especially in the context of increasing water scarcity, pollution, and ecosystem degradation.

3. Cultural Heritage and Community Engagement in Landscape Management focuses on how integrating NBS into the management of aquatic cultural landscapes contributes to preserving cultural heritage and promoting community identity.

4. Integrated Water Resources Management (IWRM): The research advocates for IWRM approaches to improve the sustainability and health of aquatic ecosystems through effective policy frameworks, governance structures, and cross-disciplinary approaches, incorporating insights from environmental science, economics, sociology, and law for successful IWRM in aquatic landscapes.

5. Urban-Rural Development and Multifunctional Agriculture: By investigating NBS for water retention and their conversion into small-scale multifunctional agricultural systems, the thesis highlights the potential of these solutions to address effective water management, cultural heritage conservation, and sustainable urban-rural development.

6. Urban Living Labs for Urban Agriculture: This research aims to explore the establishment and operation of Urban Living Labs (ULLs) specifically tailored for urban agriculture. The objective is to investigate how these labs

can serve as innovative, participatory platforms to foster local food production, ecosystem restoration, and the development of sustainable business models, enhancing the economic viability of environmental policies.

Detailed and Specific Sub-Goals

1. Enhance Water Management Efficiency Through Nature-Based Solutions (NBS):

- Evaluate the role of NBS in improving water retention and mitigating flood risks in targeted regions.
- Assess the impact of NBS on biodiversity enhancement and water quality improvement.
- Develop guidelines for the implementation of NBS that can be scaled and adapted to different ecological and cultural contexts.

2. Assess the Impacts of Climate Change on Water Resource Management:

- Study the current and future impacts of climate change on water availability and quality in aquatic cultural landscapes.
- Compare traditional infrastructure-based water management approaches with NBS, focusing on their effectiveness in addressing climate-related water issues.
- Propose adaptive strategies that enhance the resilience of water management systems to climate variability and extremes.

3. Cultural Heritage and Community Engagement:

- Investigate how NBS can be integrated into the management of aquatic cultural landscapes to preserve and highlight cultural heritage.
- Develop participatory models that involve local communities and stakeholders in the conservation and management processes.
- Examine the socio-economic benefits of preserving cultural heritage through enhanced tourism and local community identity.

4. Implement Integrated Water Resources Management (IWRM):

- Develop and promote policies that support IWRM principles in managing aquatic cultural landscapes.
- Facilitate multi-stakeholder engagement processes to ensure that water management strategies are inclusive and effective.
- Study the governance frameworks necessary for successful implementation of IWRM practices.

5. Promote Urban-Rural Linkages and Multifunctional Agricultural Systems:

- Explore the transformation of NBS into multifunctional agricultural systems that support both conservation and agricultural productivity.
- Assess the potential of these systems to support sustainable urban-rural development.
- Develop business models that integrate ecological, agricultural, and cultural values.

6. Urban Living Labs for Sustainable Development:

- Establish Urban Living Labs to test and refine sustainable urban development strategies.
- Use these labs to engage stakeholders in real-world experiments, fostering innovation in urban agriculture and local food production.
- Evaluate the effectiveness of Urban Living Labs in promoting sustainable business models and enhancing the economic viability of environmental policies.

RESEARCH METHODS

Research questions

1. How can nature-based solutions (NBS) be optimized to enhance water retention and mitigate flood risks in aquatic cultural landscapes, and what are their multifunctional roles in promoting biodiversity, water quality, and socio-economic benefits?

2. What are the impacts of climate change on the management of water resources in aquatic cultural landscapes, and how can integrated water resources management (IWRM) approaches be tailored to improve ecosystem health and sustainability in these landscapes?

3. In what ways does engaging local communities and stakeholders in the management of aquatic cultural landscapes contribute to sustainable and culturally sensitive conservation outcomes, and how can these collaborative efforts be enhanced?

4. How do conservation efforts of cultural heritage within aquatic cultural landscapes stimulate economic benefits, particularly in relation to tourism and community identity, and what models can support the sustainable integration of these efforts?

5. What innovative financial mechanisms and business models can be developed to support the adoption of nature-based solutions for water retention and the transformation of small-scale agricultural systems in urban and peri-urban areas of aquatic cultural landscapes?

6. How do Urban Living Labs enhance the efficacy of sustainable urban development projects through innovative collaboration among stakeholders and the integration of real-time data and community feedback in the planning and implementation processes?

Primary Research

The primary research methods, such as interviews, workshops, and field investigations, offer several key advantages:

- Context-Specific Insights: Primary data collection ensures that the information gathered is directly relevant to the specific study areas, reflecting the real-time conditions and stakeholder perspectives.

- In-Depth Understanding: Methods like interviews and workshops facilitate a deep dive into the subject matter, uncovering nuanced details that secondary data might not reveal.

- Stakeholder Engagement: Engaging directly with stakeholders ensures that their voices and concerns are incorporated into the research, leading to more inclusive and actionable findings.

The primary research phase involves the actual collection of empirical data. This step includes:

- Field Investigations: Conducting site visits to gather direct observations and environmental data.
- Interviews and Workshops: Engaging with stakeholders, including local communities, experts, and policymakers, to gather qualitative data.
- Data Recording: Systematically recording all data collected during field investigations and stakeholder engagements.
- Comparing with Literature: Comparing the findings with existing literature to identify consistencies and divergences.
- Drawing Conclusions: Formulating conclusions based on the integrated analysis of primary and secondary data.

- Submitting articles to academic journals and presenting findings at conferences to share the research with the broader academic and practitioner community.

Simultaneously, good practices were studied through site visits at urban farms, green city centres, vertical farming facilities, eco-cities with circular economies and renewable energy production and well-functioning landscape observatories in Catalonia, Spain and in Västra Götaland, Sweden. The development work of Landscape Observatory Västra Götaland was followed and the results in terms of new planning strategies, public participation, creation, and the realisation of new, local, and regional business models were recorded by using questionnaires. Furthermore, site visits and field studies were carried out in reconstructed aquatic landscapes in Hungary such as the Little Balaton (Kis Balaton) and the Lake Tisza, where multifunctional ecosystem design and development of eco-tourism were studied. It is critical to understand that "good practices" identified in one context do not imply "best practices" for everyone. Each solution must be carefully tailored to the local conditions.

Secondary Research

Secondary research complements primary research by providing a broader theoretical and contextual background. It involves the analysis of existing literature, datasets, and documents, which helps in several ways:

Theoretical Foundation: Reviewing existing literature helps build a solid theoretical framework for the study, situating the research within the broader academic discourse.

Contextual Understanding: Secondary data provides context and background information that helps interpret primary data more effectively.

Identification of Gaps: Analysing existing research helps identify gaps in knowledge, guiding the focus of primary research efforts.

The secondary methodology approach utilised in this study consists of a comprehensive literature review and methodical data analysis focusing on the management of aquatic cultural landscapes, including urban ecosystems, environmental contamination, infrastructure development, spatial planning, landscape conservation, and the integration of green infrastructures. The

integration of secondary and primary research methodologies was crucial for validating the study's findings and ensuring their robustness.

SUMMARY OF RESULTS – THESIS POINTS

The results of this research can have significant effects on multiple levels. Firstly, they can inform water management practices by demonstrating the potential of nature-based solutions for water retention and their role in supporting sustainable agricultural practices. This can contribute to more efficient and effective water resource management, promoting environmental sustainability and resilience. Secondly, the research outcomes can help in the preservation and safeguarding of cultural heritage. By integrating nature-based solutions with cultural heritage values, the research can provide insights into how water management practices can respect and promote cultural heritage, fostering a sense of place and community identity. Lastly, the research can contribute to sustainable urban-rural development by identifying opportunities for small-scale multifunctional agriculture. The key scientific contributions produced in this thesis are crucial for the advancement of aquatic cultural landscape management.

1. Innovative Integration of Nature-Based Solutions (NBS)

The thesis introduces novel approaches to integrating NBS into traditional water management systems, significantly advancing the practice towards more sustainable and resilient management of aquatic landscapes. The development and application of these solutions have proven crucial in addressing complex challenges such as water scarcity, pollution, and ecosystem degradation, particularly under the pressures of urbanization and climate change. This research contributes to establish a comprehensive framework that not only enhances biodiversity and water quality but also supports community engagement and cultural heritage preservation. This framework is particularly innovative in its ability to adapt to different geographic and socio-economic contexts, making it a versatile tool for global application.

2. Enhancement of Urban and Peri-Urban Agricultural Practices

Another significant contribution of this thesis is the development of sustainable urban and peri-urban agricultural practices through the implementation of NBS. These practices are designed to optimize water

usage and enhance local food systems, which are essential for the sustainability of urban expansions. The integration of water-smart agricultural techniques and models contributes to the development of scalable and sustainable agricultural practices that reduce the ecological footprint of cities.

3. Advancement in Stakeholder Engagement Models

This thesis has developed and refined models for stakeholder engagement that facilitate the collaborative management of aquatic cultural landscapes. These models ensure that various stakeholders, including local communities, governmental bodies, and non-governmental organizations, are actively involved in the decision-making process, leading to more effective and sustainable outcomes. The collaborative governance framework that incorporates the contributions of diverse stakeholders has been pivotal. This framework not only enhances the implementation of NBS but also ensures that these solutions are culturally and socially acceptable.

4. Policy Development for Sustainable Landscape Management

The contributions to policy development, particularly those that encourage the adoption of NBS and sustainable practices within aquatic landscape management, are notable. These policies are designed to foster long-term sustainability and resilience. Evidence-Based Policy Recommendations are supported by extensive empirical research. These recommendations provide a pathway for policymakers to integrate scientific findings into practical, actionable policies that promote sustainable landscape management.

5. Educational Contributions and Capacity Building

Finally, the educational contributions of this thesis should not be overlooked. Through the dissemination of findings and the development of educational materials, this research plays a crucial role in capacity building among practitioners and stakeholders involved in landscape management. The creation of educational tools and the conduct of workshops have significantly contributed to building the capacity of stakeholders to implement sustainable practices effectively.

LIST OF PUBLICATIONS

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